## TECHNICAL SESSIONS

### Session 2: Navigation Information Systems I

### Chair: Rudy Peschel, Saab Transponder Tech

Good afternoon everyone and we would like to start he afternoon session. We are the act just before dinner. My name is Rudy Peschel, and my name appears two times – once in the roster of attendees where I'm listed as U.S. Coast Guard, but I want to be sure that you know I am retired. I am a resident of Key Biscayne. I'm what they call a condo commando, a person that sits on his balcony and watches for flare sightings and calls 911 once a month, and bothers the old Search and Rescue Office that I used to head. I am a part-time Type A, so I work in bursts which is shown in my conference here – I have a collection of notepads from many of the conferences I have gone to over the years, and each and every one of them has something written on the back which illustrates the big point of that particular conference. This one here is the Wheel of Fortune (SLIDE 1), and it is the "fortune" as in cookie, not the "fortune" as in money. At conferences like this we often swirl around and go around in circles, but do we ever penetrate the middle, and do we ever go to those two things that should be decided in short courses of time. The dollar is always a necessary objective and the other is the stack of papers call the plan. So, shouldn't we always be aspiring to figure out how much things cost and how they fit strategically?

I am also listed as Chair of this particular group as a member of Saab Transponder Tech. I am not full-time, but I am a consultant, again my part-time Type A. But, I am simultaneously going to be filling in for Magnus Nyberg of Saab Transponder Tech, who was not permitted to fly out of his native country of Sweden on Monday. Magnus' CD-ROM did not come by express mail today, so I have captured Magnus' comprehensive dissertation on AIS Networking – that was a CD-ROM onto one single sheet of paper which will thus be the layman's interpretation.

I would hope to get Magnus' CD-ROM onto the conference notes at the conclusion of this, and if you go into the roster of attendees, Magnus' e-mail address is incorrect in that – the .se is listed as sc, so he won't get your e-mail unless you give it a .se (short for Sweden). So, so much for the pop-art slide.

(SLIDE 2) This is more of my high-tech and hopefully where we are going today. We are going to be talking about information systems, but information systems really are a part, from my observation of the Marine Transportation System (MTS) Infrastructure Committee, information systems is a big part of that particular look at infrastructure. The implications via MTS are because it is indeed a Committee within it, and there is no more implication for attaining maritime domain awareness than to have information systems that bring us the good stuff.

To be debated during all of this (and to keep in the back of your mind) is the proper role of government. It is not only the public versus private sector of what is the role of government/what is the role of industry in this, but what is the need for research as we go into a quest of information systems that enable us to have, indeed, a maritime transportation infrastructure in these United States. Should research be a government function? Is that the proper role of government, or is this research a province of the capitalistic system?

There are many kinds of information systems and you see my footnote that says this list is not necessarily in priority. There is also no indication of dependence versus independence. This is not meant to be inclusive. So, if something is left out, we can schedule another conference. But, we are looking at GPS and NDRS (the National Distress and Response System). Commerce network application of AIS will be more talked about on Friday at 11:00 a.m. The intel networks – the Intelligent Waterway Systems – Electronic Charting and P.O.R.T.S.. We will also be talking about Risk Management this afternoon and risk management cannot be had unless we have application of AIS information from these various information systems. So, our speakers today will be attacking pieces of this. Some more of this will come on Friday. Again, keep in the back of your mind when it comes to question time – should we talk about what is the proper role of government in fostering some of these concepts and where is it all going? What is the cost, the worth? Is there a plan?

I'm going to get to Magnus' part now on AIS Networking. His rather comprehensive CD-ROM to a layman looks like this (SLIDE 3), and it indeed is this simple. This is Sweden, a country that has chosen to implement an AIS network. First of all, I have defined AIS and that is what is now accepted, using self-organizing time division, multiple access SOTDMA technology in the marine VHF-FM frequency domain under ITU-R M.1371-1. This is the now and the future. This is not the "AIS" of the past. We are not going backwards. There is now a dividing line and we must not confuse the different generations of AIS.

AIS that you hear about for pending carriage requirements out of IMO for 300 gross ton SOLAS vessels beginning the year 2002 is AIS of the future under the 1371-1 ITU standard. In Sweden, the country is ringed by AIS networking repeater stations around the periphery of the country. Those stations can receive ship-to-shore information from ships at sea. Of course, AIS provides ship-to-ship communications. In a country such as that, Competent Authority can take information off the AIS network for oversight for marine domain awareness, for traffic management, and those sorts of things.

In Sweden, there also is a capability for commercial outlets to make use of this very same network, and this is an inclusive use of AIS that perhaps would not be possible in these United States because of some of the prohibitions and so forth on some of the frequencies. We will hear about those issues a little more in the presentations to come.

So, AIS networking is one of those many pieces with potential for information system exploitation to allow technology to do all those things that we heard about this morning, affecting security, safety and productivity.

Each of our following speakers will be limited to 15 minutes or so. We are somewhat a cats and dogs collection of different aspects of information systems, but we would still like for you to hold your questions until the end. So, we have 15 minutes each for our panelists, and as I introduced myself, I would like you to follow suit because I don't think we have the time today for me to recite bio information.

Jay Spalding represents the U.S. Coast Guard and he will talk a bit about the Intelligent Waterway Systems.

**Jay Spalding, U.S. Coast Guard**
**"Intelligent Waterway Systems (IWS)"**

Rather than take time away from my presentation, I won't introduce myself other than to say I'm from the Coast Guard R&D Center. What I'm going to be presenting here is not a project in progress necessarily, but more or less ideas in the way we want to go.

We have an investment area we call Intelligent Waterway Systems (IWS). The way I have defined it here – if you don't agree with that and have a better idea, please talk to me. I've been working on that for a while. But, the part I do think is good is the objective to do the things we heard about this morning – good security while improving safety and mobility of the MTS.

It is difficult because we have a very diverse user community. I see all these as requirements of the IWS. The third point is very important – being able to handle both public, proprietary and sensitive information. To do that, we provide security for users. The way we do things now and what we might look at information systems for waterways is basically a series of stovepipes where the information is funneled from users to providers. The providers may do a lot of gathering and a lot of outreach and integration of information. They will put it in their package and send it to the users. There are a lot of navigation-related systems here, because that is what I'm familiar with. I'm sure many of you have other systems you could put up here. These are examples – they are not meant to be all-inclusive. The main point is these systems don't talk to each other.

If you follow MTS like you all should on the MTS website has been posted a report done by Potomac Management Group that brings forward the need, pulls all the requirements out of the NRC report, the MTS reports on the need to integrate information systems in this area. That is what it does – it brings up the needs. It doesn't address how to do it or what.

What I am going to propose now is that we work toward a network solution to integrate these applications. We have some things going on – I should back up a little bit. We are the government partner for a National Science Foundation effort with Arizona State University. We don't put any funds in there or really expend any resources there, but we are working with ASU in their effort. What they have done so far is focus on using the coast pilot as an example of bringing forth digital information. We are trying to put together this project to cut across the stovepipes and put together a real integrated approach toward information.

To develop such a network, we see protocols and formats and means for seamlessly transferring the data between providers and users. When you start getting into a network situation, we start cutting across. Just take the example of navigation information just to keep it simple. If you look at the three lower blocks, those may be providers of information coming from different sources – maybe from Coast Guard, NOAA, and safety information from the Coast Guard that may have, in the past, been combined into a local notice to mariners and sent to users via the mail or the web. Then, a mate on the ship puts it on their charts. In this future network solution, that information would be posted to the network or pushed on the network and the ship, through its own networking capability, would draw that information as it needed as it transited different areas and apply it automatically so we could both gain efficiencies and safety in this situation. Plus, we could start to achieve more systems getting port arrival information in and getting AIS information out to the network and start to really achieve some assessable awareness as to what is going on with the waterway. This isn't going to happen overnight, obviously. If we don't start integrating things now – we are developing new systems today that aren't looking at talking to each other either.

Finally, when we get to some future point here – the point of this one is to show that users are often providers also. A vessel would be a user. A blot of information would also be a provider of their information, their information about their cargo perhaps. Coast Guard is a really good example of that in that we need chart corrections as well as everybody else. Plus, we make a lot of chart corrections.

Marine exchange of information is a huge provider. It also may be a user of the network as well where they tap into the network to get package information for their users.

The important thing here is that this network doesn't do everything for everybody. It is just a means to communicate. The opportunity is in the private sector to interface with this network, provide information to it, and extract information and package it for the individual users within the waterways systems.

To build such a network, we would build it up – now we are going into areas we haven't done that much – build it up using the existing technology in a layered approach. The one key factor in this selection of technology here is both the use of pier-to-pier technology for networking and using XML for formatting the data. Those are both fairly new things. The power of pier-to-pier networks is just coming to light over the last year or two on the internet. There is a new network that came up in April called Morpheus which went from zero users to over six million users over the past six months. You currently have access to over 300 tear bites of information on that network right now. It has become the way to exchange large amounts of data on the internet using the pier-to-pier structure, and it is completely separately from what you think of as the web.

Security can be easily inserted in here using off-the-shelf security means.

Pier-to-pier does a lot of good things for us in our situation. It let's everybody communicate directly with the people they need to, and it also lets the people, agencies, private companies,

keep control of their own information that may be proprietary or whatnot. So, it lets you establish these direct connections, but the user looks like one big mass out there. But, you would have to go through whatever to get access to individual providers who have to go through their systems.

There is Arizona State University. We began this last year and their big goal is to create this computation ontology and ontology is a way of organizing the data, basically. The main this is to develop relationships between the data, that would then be expressed using XML.

When you put it all together, you put together standards for formatting the protocols, the ontology which helps you describe the XML, and that will lead to the creation of what we call MIML (maritime information mark-up language). This would be an XML-based method of marking up and formatting maritime information. It would allow easy exchange between computer systems. Most new database systems have XML capability, both input and output. So, it wouldn't be a big burden on providers to format the data this way. The big burden is how to format – what structure it should be to work well for everybody. That is what this project could work on.

There are many different aspects you may want to include in such a language. Categorize the information; geocoding everything so it can be searched by location; time-tagging everything so you can disqualify old data. So, perhaps using a different tiered approach to support different bandwidth lengths.

These are examples of information categories that came out of the PMG report.

The big reason to talk about this here is that this whole thing would require a lot of cooperation between the agencies, and to develop the content of the XML.

What we hope to do in the Coast Guard is to develop the expertise as to how it should be structured, but the content has to come from all the providers and users of the information. What information do you need? What information are you providing? We will go forward with that.

Then perhaps the Coast Guard or an inter-agency group would take it forward in the future and to maintain the documentation and improvements to the language over time, once we get out of the R&D phase.

This is what XML looks like. I imagine for a lot of you this may be new stuff. What XML does for the information on the web is that it provides the information about the content of it. HTML just tells the computer how to format the data and how to make it appear on the screen. What XML does is it tells the computer what the data is. So, it tells it what the data pertains to – it depends on how you structure it. But, it allows the computer to actually take action on the data it is getting, rather than just explain it on the screen.

This would be some more information on these two technologies I've been talking about. I can give this to you afterwards too.

The main benefit to this approach, the way we see it, the Coast Guard has looked at developing more centralized database architectures, and it is very difficult in this arena because we have a lot of different interests, a lot of different control of the data, both public and private. Nobody wants to surrender that and they probably shouldn't. That is their role to provide that data. This type of a pier-to-pier network would allow each individual agency to provide the data without having to all have it centralized in some way.

Another good reason for this, as we all know in this area, funding is a problem. This approach, because each agency would have to participate in the development of their own content, the costs for that would be spread and would be relatively small for each agency, as opposed to one agency trying to do the whole thing.

Tomorrow, at lunchtime, I invite any of you who are interested in this to grab your box lunch and head to Room 250 and we will talk about what your particular interests may be and what information or whether you want to participate in this effort. It would be very helpful for us to get a gauge on what the other agencies' interests are, and also what industry's interest may be in participating in the development of such a network.

Thank you.

**Mike Brown, National Ocean Service, NOAA**

**"The U.S. ENC Program of the Coast Survey"**

Thanks, and good afternoon ladies and gentlemen. My name is Mike Brown and I'm with NOAA's office of coast survey where I'm the electronic navigational chart technical manager and what I would like to do this afternoon is give you a very quick overview of our ENC program at NOAA – what it is, where we are, and where we're going.

First of all, just to provide a little context. At Coast Survey, we have a suite of 1,000 paper charts that we maintain that cover the United States territorial coastal waters. We also have an exciting new product – print-on-demand charts, which are paper charts which include all the notice to mariners corrections which mariners or chart users can purchase up-to-date to the current notices, which saves a lot of time and energy on applying hand corrections. We also have a successful raster chart program which we have developed in coordination with our partner, MapTech, which also has an updating service which allows you to subscribe to raster patch files so you get those notice corrections attached to e-mails, load them right into your system, and automatically update your raster charts.

But, I'm here to talk a little bit this afternoon about the electronic navigational chart project, which is really the fourth product we have in the marine chart division. One other thing before I go on is that all of those products are maintained for a lot of information that comes into NOAA and into Coast Survey. We are the focal point in the U.S. for this type of information where it comes in, gets evaluated, and compiled onto these nautical charts. Just to give you an idea of

some of the volume from our federal partners from the United States Coast Guard, we get approximately 10,000 local notice to mariners corrections per year; about 15,000 documents from the U.S. Army Corps of Engineers – those are typically blueprints, surveys of channels and construction permits; we also get data from NOAA field units, EPA, USGS and other federal agencies, as well as private sources such as U.S. Power Squadron, private boaters and others. All this information comes in and gets evaluated and compiled onto this suite of products.

So, what exactly is NOAA's ENC? Well, the acronym stands for Electronic Navigational Chart, which means that it is a special type of vector chart. A vector chart is, in essence, a database of chart features. It is a database that contains the position of features, their geometry or shape, and attribute information about them such as a buoy, where is it, what color is it, what is its name, and so forth. This database of chart features is produced using an international standard that is IHO-S57 standard, currently in edition 3.1. The S-57 standard has a product specifically in it for ENC, which tells us exactly how to encode everything, how to build these ENC's so that they are usable in any number of navigation systems or in potentially other applications.

Finally, ENC data essentially works like a marine GIS. If the system that is using the ENC has that kind of capability, you can turn features on and off, you can select things, and the system can do intelligent processing on the data.

Just by way of comparison, the raster chart, which looks just like a paper chart and it should because it is essentially a digital picture of the paper chart. On the other side, we have the vector chart. This is in San Francisco Bay. That is drawn from a geo-reference database of chart information which, if you will recall from the high tech slide in the first talk, ECS was one of the listings on there. So, there is a tie-in there for AIS applications. There are ties in for vector data and ports for real-time tide water level information. Since it is a database, that kind of data can actually interact with the data that is in the ENC.

One thing that is very important to keep in mind with any of these electronic products is that, for the most part, they are derived currently from paper chart products. Even if they weren't derived from paper chart products, they are derived from surveys which were conducted using techniques like you see here up until very recently, which means that in the era of DGBS or WAS or kinematics GPS, the end-user out there on the ship knows where they are to a much greater degree of accuracy than the data they are navigating on. It is a real important educational point that they understand that just because the chart is on a computer, doesn't mean that it is better data.

So, what are we doing to address that problem? Well, in the ENC program at NOAA, we started off by trying to incorporate information directly from our chart sources, wherever possible. So, for instance, channel limits come from larger scale Corps of Engineers blueprints or digital data, where available. The aids to navigation are built from U.S. Coast Guard local notice positions. We went back and research wrecks and obstructions out in navigable waters where was had original source that had more accuracy, we used that.

The second thing is that the ENC database, once we built it from the source where we have it, but in most cases from larger scale chart information, we maintain that database for the chart

source as it comes into the office. So we apply it to this ENC database at the scale that is provided, or at the accuracy that it is provided, rather than from a generalized source such as a paper chart. But, in all cases we also maintain a one-to-one check between the ENC database and the other products to make sure that any critical content is adequately represented. It is similar to what we do with large scale paper charts. They are always compared to the smaller scales, or actually the other way around, to make sure that important, dangerous features that are portrayed on one scale are shown on the other scale so the mariner knows they are there.

One other factor in this project to build essentially a database of chart features to produce the ENCs is that it feeds into the concept of building a database of marine features that can then be used to produce those others products that I mentioned before, such as raster charts and paper charts. So, what we are doing with this ENC program is trying to get a "prime the pump" if you will, and get a database built from the best data we have available and then go on from there.

Some of the customers that we have for ENC data – obviously, the navigation community, ECDIS (electronic chart and display information system), ECSs (electronic chart systems), AIS, and also port management applications that need chart information or chart data to use for managing traffic, and also coastal zone management, GIS applications where managers want to have maybe some parts of the nautical chart in their system for doing other types of analysis and policy-making.

The navigation customers, again ECS and ECDIS. Port management – here is an interesting application that is actually on the web right now. The Port of San Diego has this up. It has ENC data that you can see there of San Diego that we produced, and it is actually tied to real-time tide information. You can also see under the view menu they have construction and hazard areas, marine events, environmentally sensitive areas, and things you can click on and overlay on this chart right on the web. So, it is a like a web-enabled GIS application with real-time data.

Then as I mentioned GIS applications for coastal management – this is ENC data in San Francisco Bay where I just pulled in a few ENC features such as bathymetry, land area and built-up areas which are the cities you can see there. Then I overlaid habitat information on top of it. We have eel grass areas, different types of fishing areas, and so forth. So, the ENC data is a natural fit to go into this type of GIS environment where you can just pull in the pieces you want and not have to deal with the rest of the parts of the chart.

Our planned coverage – we have it divided into two phases. The phase one (the red rectangles you see) represent approximately 200 chart equivalents. Those cover the 40 major commercial port areas in the United States. We've been working on that for a couple years now, and right now it looks like we are going to be finishing that right on schedule at the end of this fiscal year. We also have the phase 2, which gets us the rest of the contiguous U.S. and we will be starting to work on that as best we can once we have the 200 up and in maintenance.

Our current status – the blue rectangles here are ENCs that have been completed and posted. The magenta rectangles are remaining. So, here we have the Gulf, East Coast, and Great Lakes areas. On the west coast, we really only have San Francisco and San Diego. Then in Alaska, we

have some ENCs for the Port of Valdez for the VTS coming out of the oil terminal. Then here is just a text list of the ports we have available.

Our distribution model is a bit unique in the ENC world. We are actually posting this data on the internet for free download rather than trying to sell it. We did this to try to get the widest possible distribution. Because there are so many different customers that we have identified that are interested in the data, as well as probably a lot that we haven't identified that would be interested in using this data. We wanted to get it out there and open it up so that different applications can be developed. Plus the fact that it is based on an international format that is open and available to any developer. We don't have to support building a market for it. There is already a market there. This also aligns us with some of the other federal agencies that work in the same area such as Coast Guard – the local notices go up on the web for free. The Corps of Engineers is posting survey information. They also plan to post inland waterways electronic charts as well. The NOAA/ENC is actually the first of our databases that we are considering releasing in this manner.

By distributing it on the internet, we don't place any restrictions on the use of the data. Value-added people can take this data, make other products out of it. You see down here one that the colors are a little strange and they are not quite chart colors, and that is an example of an alternative product that could be derived. I have a screen showing some AIS symbology over here. By putting the data up this way, we are allowing this more accurate ENC data to be used in other commercial products so that the overall quality of data that is available to the marine community can be brought up. Again, it allows for a maximum free market evolution of these types of products.

We started posting data in mid-July, and we really haven't advertised the fact too widely that it is there, but even though we haven't announced it other than one particular public meeting, we have had over 34,000 downloads of ENC data since that time. The data is posted at this website. My name and contact information is in the package you got, so if you don't want to write this down now. Please feel free to send me an e-mail. You can get to it from the main coast survey web page as well.

This is a view of the opening page. We have some overview information. We have a fairly extensive, frequently-asked-questions list. I wish more people would read it because I get a lot of e-mails that people go straight to free data, download it, double-click on it, and then nothing happens and I get an e-mail – what is wrong with your data. So, they don't realize you need some specialized applications to view it. We do have a resources page which answers that question. There are actually free viewers to download to view ENC data and play with it a little bit to see what it looks like, and we link to those.

Finally, this is the current download page that you get when you finally go through to the download section. You just check off the ones you're interested in, hit the download button, and the download starts. We plan on having updates for ENCs starting early next year. We probably will shoot for monthly initially until we get any kinks worked out of the system, and then we want to go to the same weekly scheduled that we have for the raster product.

We also will be replacing this interface in the next few months with something a little nicer that has a choice of either a list, if you really like lists, or a graphical interface that will have a map that you can zoon in on and drag select data, and things like that.

So, again, my e-mail address is also in the hand-outs. Thank you.

Peschel – Thank you, Mike. Kathryn Bosley from NOAA will talk to us about ports.

**Kathryn Bosley, National Ocean Service, NOAA**

**"Prospects for P.O.R.T.S."**

I'm Kate Bosley and I work for NOAA's National Ocean Service, in the group that has developed and currently runs the P.O.R.T. system. For those of you who might not know, it stands for Physical Oceanographic Real-Time System.

It was developed in response to users out there in the navigation community saying that, in addition to some of the static information they had, they really needed some real-time information about what was going on out there in the waterway. It is a decision-support tool that is meant to be one of the many tools in the toolbox of the navigator. It supports safety and efficiency, and I think almost equally. We've heard a lot this morning and early this afternoon about efficiency and throughput and so forth, and the money that is to be saved by not hanging around waiting to unload or saved by loading extra. But, there is also the safety factor to consider, especially when I look at the size of those ships they are talking about and think about them meeting each other in some confined space – it boggles the mind.

There are many areas of the country where what is predicted in the traditional NOAA tide tables, or water level, can be very different because of meteorological conditions from that of what is observed. The safety factor comes in when you have less water to navigate in than you thought you were going to have.

Currently, the suite of sensors that are in ports operationally are tides, water levels in the Great Lakes, meteorological data, wind speed, gusts and direction, barometric pressure, air temperature. Then in the water, density for draft calculations, salinity and temperature and currents are obtained in most cases now from bottom out, giving you a profile of the currents throughout the water column. They collect data every six minutes, transit it to a centralized data acquisition system that is local to that port area. In some big places like Delaware, which is going in now, and the Chesapeake, there are two local . . just because of the geographic extent. Then, it is transmitted via the web and via voice. We will talk about the product line in a minute. This is in real-time every six minutes.

There are three currently big things on the horizon for us sensor-wise and they are in response to user requests. Visibility – we're testing various technologies for doing visibility, waves, air gap or bridge clearance. There are many areas like the C&D Canal – even if you deepen it, especially in looking at those pictures today where they are stacked on top and you're thinking of

putting the truck on there too and the rail cars, and at some point you're going to be barely squeaking under that bridge.

I know this is hard to see, but right now there are seven existing full-blown operational ports. They are Naraganta Bay, New York/New Jersey, Tampa Bay, Houston, Galveston, LA/Long Beach, and San Francisco. We are very excited that in October we signed an agreement to enhance the Chesapeake Bay port and make that a full port. That was with the Maryland Port Administration. Coming on-line right now is Delaware. There are crews there now implanting the Delaware ports. So, that is what up in the very near horizon.

Then for the rest of this fiscal year, there are some smaller, single-site ports, one-station ports that are going to be upgraded so that the quality control is put in place. Those are in Anchorage and Nakisky, Seattle and Tacoma, and in New Haven, Connecticut.

We've done some pretty extensive requirements assessments in several key areas in Charleston, New Orleans, Jacksonville, and Puget Sound. Then there are over 24 other places that we have ever given presentations, or they have expressed interest in seeing what P.O.R.T.S. could do for them.

P.O.R.T.S is by definition and by Congressional direction, a partnership. It depends very strongly on interaction with the user community, designing a system that meets their specific needs in that waterway. What NOS brings to the table is that oversight, technical expertise, standard-setting so that there is a seamless transition from port to port so the products and data and the quality control looks the same as we go from place to place. There is easy public access to information. The previous speaker was talking about putting everything on the web and making it available to the whole public, so that even the recreational community has that information and can use it to hopefully get out of the way or make sound decisions as well.

Then very importantly, the last bullet, 24 x 7 quality control. That is the federal responsibility to make sure that the data that is being put out there is of the highest quality.

On the local side, and it is a big one – funding for implementation and management, and that is by Congressional direction through the appropriations language. They also, of course, provide all the feedback and tell us how they want the system to look. Outreach is a shared responsibility – both NOAA and the local partners.

I just want to talk a little bit about how we do quality control because one of the very neat things we are doing this fiscal year and next fiscal year is upgrading the system, yet another acronym – NOAA – this stands for the National Organization for the Advancement of Acronyms – so this is CORMS – Continuous Operational Real-Time Monitoring System. Think of an operator sitting in a room in the weather service office in Silver Spring, Maryland, staring at a screen, receiving information every six minutes from all these systems and making judgments about them. You can imagine it is fine when you had two or three and maybe even when you had four, and okay when you had seven. But what happens when you have 22. At what point does that overwhelm the operator. So, that is what we're looking at in the next generation of CORMS II.

The quality control flags are set at the data acquisition side. So, there are a bunch of rules put in place; flags are set; a light turns red, yellow or black. Black is for communication outage. Yellow is to take a look at this. Red is – it doesn't look good to me. This is just a demo slide. There aren't usually that many red dots. I just wanted to make sure you could see that contrast, and I know that red and green is hard for people who are color blind.

The operator then goes in, has the ability to click on that red dot or yellow dot, go in and look back in time, compare it to neighbors and so forth, and make a judgment about the quality of that data, and then stops dissemination. That is the important part – stops dissemination – not stops archiving it. We are still bringing it in and collecting it. It is just not going out so the potential to be a problem is there.

As I said, we are thinking about the future and there is just no way one operator or two operators could handle the projected increase. So, we have been working with a consultant looking at how you use a hybrid actually of rules and case-based artificial intelligence to take some things you know. For instance, rules-based would be the water level should never exceed X or never go below this number. That is a rule. Case-based would be under these meteorological conditions in the past that we have observed, we know that the water level should be this or that. So, a hybrid of that comes into this thing called the mind box, and only things that have been flagged. Things that are set green just pass on by. We try to apply some of the rules or the cases that we know about and then give the operator some choices. Oh, when they are all black, that means probably the communication network is out. If the radio is out, you should do X, Y and Z. So, trying to go to the next level and help that operator . . . .

Here are our websites. We have a booth out just by the coffee there where you can pick up brochures and get our website address and so forth.

Just an example of some of the products – these are available about every six minutes on the web. This is an example from New York/New Jersey in the area of the . . . . Narrows. So, up in the top left-hand corner you see the water level at Sandy Hook, and the blue line is the predicted. So today, the day that I took this on the 5th of November, the observations were very close to it. But, you will see there are plenty of times when that is not true.

The currents – what is interesting about this is the green dotted line is the cross-channel flow. The red is the long channel flow. Look at the vertical structure – going from 2 knots at the top – you see there is often a very strong vertical gradient which is very important for deep draft shifts, feeling something very different at the surface, or if you are watching the water rushing by a piling or a buoy, it may not reflect what is going on down below.

Wind speed and direction is a time series, and then the ancillary data here is specific gravity and salinity. We actually have been experiencing some quality control problems in all of the sensors for conductivity. They have been shut off at this point and we're working to get those back soon. Then, just a vector representation displayed on the chart of the water flow.

This is just a dramatic example. I just wanted to show you again that this is a pretty recent example from Tolchester, Maryland. When you have strong wind out of the northwest, it is very

shallow up there and very influenced by the wind. It doesn't take very long – 5-6 hours of the wind blowing – and the water just drains out and you see here 1.5 feet below the predicted tide for that time.

It is also available on a voice system like when you call up your bank, and this is what it sounds like. It says, good morning or afternoon – it knows what time it is. It tells you what time it is. You select through – 1 for currents, 2 for water level, 3, etc. These are the numbers. As I said, they are available out there.

Another product that we are working on developing, we feel the natural extension of real-time data, is a forecast model. So, there are plenty of places where information into the future will be very useful in terms of loading or safety issues, or whether you would need to lighter. The one system that we do have that is operational is here in the Chesapeake. We have systems under development in New York/New Jersey, Houston, Galveston . . . . tie that into information a person can use. Those are R&D efforts that we are looking into.

Another R&D effort that we're undertaking now is a lot of people have internet access right on their cell phone and on their screen. So, how would we reformat the data so that you can get – not the graphics, but some textural information on your actual cell phone with a wireless modem.

So, in summary, the P.O.R.T.S. program continues to grow through the strength of the partnerships that we have developed and are developing with the user community.

Talking a little bit more about the three big sensors that we are looking right now – the tools for the future – visibility, air gap and waves. I will tell you about the progress in each of those areas. This is actually a weather service test facility out in Sterling, Virginia. That is just rows and rows of visibility sensors that are being tested by the weather service that they use to make their . . . . We have purchased two types of sensors that are out there being evaluated. We are doing a side-by-side comparison. In general, the agreement is quite good between ours and what we considered to be the standard, that is the weather service accepted.

In the bridge clearance area, there is a bunch of ways you can do it. You can put a GPS on the bridge, and if you know the tide level, subtract the two numbers. You do the math and that the whole underneath. A couple problems with that – one is usually what you're interested in is the low steel. You can't put the GPS down at low steel because it can't see the satellite so then what is the offset in relationship in any motion in that bridge between where you put the antenna and that point on the bridge that you're interested in. Also, if that bridge is flexing under loading, temperature and so forth, it isn't just necessarily a static subtraction. So, we are looking at sensing capability of measuring that gap. One that is available on the market now is a microwave sensor, developed in Sweden by Maersk. It is used on offshore oil rigs to do waves and water levels beneath the platform since they are very interested in knowing that loading. This graphic just shows – we put it down in the Army Corps of Engineers test facility in Duck and compared it to our acoustic tide gauge there, and the agreement is very, very good.

In terms of waves, there are a couple technologies we are looking into. Both of the manufacturers of current meters that we use have developed algorithms by which you can get not

only the currents, but also the waves. You have all the beams of information. So, we are looking at evaluating that technology. Also, we have the wave-rider, traditional buoys that you think of that sit on the water – and the . . . air gap sensor as well because it does sense that water level that if you were to sample fast enough, can give you waves.

This is the David Taylor Test Basin down in Carderock, Maryland and it is hard to see, but there is a carriage, very well instrumented test facility. So, they have all this pressure, arrays, giving you data that you can compare your sensors with. We deployed our sensors there and we are still looking at the data, but this is one comparison plot that is promising.

So, in summary, NOS has established and test and evaluation program looking at new sensors and new products, new ways of delivering things and to test those out in the R&D environment before transitioning them to operation. We are also looking at the next generation of quality control, CORMS II, the rules-based and hybrid case-based systems. NOS and its partners are developing nowcast and forecast models. Nowcast is important for many areas where we first go in to do requirements and they will say I need currents at these 25 places, and we say, that is hard to do operationally, pretty expensive to maintain – what do you think about these four places. Then we will build up enough data, get a model that is validated, and we can give you information now (nowcast) by using a numerical model at the other . . . and not have to keep a current meter running there all the time.

Thanks.

Peschel – Thanks, Kate. Vladimir Trbojevic is visiting from the U.K. with EQE International, and he will speak to us about Risk Assessment and Safety Management.

**Vladimir Trbojevic, EQE International, Ltd.**

**"Linking Risk Assessment of Marine Operations to Safety Management In Ports"**

Transcript unavailable.

Peschel – I think it would be interesting to ask the first question as to how do you foresee this policy or practice being adopted by Competent Authorities, and do you see a worldwide standardization toward approaching this means of risk analysis?

Trbojevic – I think is going to generate the best practices. It is probably going to be . . . in Europe very soon. There are moves in Europe to adopt this approach. There is something interesting with regard to the risk and safety in Europe. What the U.K. does . . . . . So, I think as soon as it becomes the best practice and it will be adopted in course. But, I think we will have a situation with the port . . . be able to demonstrate that they are operating safely, but

the vessel won't be able to demonstrate because the standard implementation . . . . is far removed from any safety management system.

Peschel – Questions from the audience?

Polowski – Bob Polowski with Talus. I'm involved with a Nor-Control simulator up in Seward, Alaska. I guess my question is – have you taken your risk assessment model into marine simulators and ran scenarios to see if the model actually matched the performance of the people or vice versa?

Trbojevic – No, we haven't. To tell you the truth, we have a template of information about the port management and about management of these operations, but we haven't sorted it out because we just don't have time. We don't have time or resources because all the ports in the U.K. have to implement by the end of this year. The regulation was introduced less than two years ago. So, it is just simply that. But, we will try to verify these things.

Peschel – A program such as P.O.R.T.S. is probably not on the list of the most important subjects for infrastructure considerations and I would think these two people in the front here would say that dredging needs to be the most important thing looked at for infrastructure. But, P.O.R.T.S. looks like one of these small investment, big pay-back type of things that should be included within the umbrella of infrastructure. Is it really the future of P.O.R.T.S. something as beneficial, to really remain by "passing the hat" to substantiate and to sustain that kind of benefit to the maritime operating public?

Bosley – There, of course, has always been a discussion among the local user community that there should be some federal role in this and what is the appropriate federal role and that balance. But, until the preparation language is changed, we are prohibited from expending federal dollars on operational maintenance and support. We continue to get a lot of support from the pilots associations and so forth and getting Congressional funding to maintain our part of it.

Peschel – It seems that P.O.R.T.S. had to catch on. The train had to start moving from the station. But, two events that I didn't see why it took so long between was the start-up of PAWSS in Lower Mississippi and all of a sudden you list the Lower Mississippi as just now getting going. You would think there would be a push to have had P.O.R.T.S. coincide more with the beginning of PAWSS.

Bosley – And VTS. There was a push to include it in VTS. They are two different agencies. I think we all know what that means.

Peschel – I'm not seeing questions out there, so I'm just going to ask a few more. Mike, you were giving some pretty good news about the advancements of electronic charting. I think three years ago there would not have been that degree of optimism or those colors all over the U.S. So, I would say your agency has leaped forward. Did you want to add anything more as to how this will all work toward MTS?

Brown – Well, as I mentioned, our initial goal of 200 chart equivalents by the end of the year, it looks like we are on track for that. But again, the resources to continue beyond that to work on coast-wise coverage and such is always in question. Maintenance is a big issue because once you build them, you have to maintain them. That has always been an issue in the past that money gets cut loose to build some, but then to maintain it – and with this kind of data, once it sits on the shelf for a few months – the changes build up and it is hard to get back out of that hole again.

Finnerty – Peter Finnerty. Could the panelists, in some form or fashion, tell us what is the order of magnitude in terms of money – how much money are we talking about? For each of these programs – in other words, the comment was made that the rules right now under appropriations don't allow you to expand federal funds. It is a million? Is it ten-million? Is it a hundred-million? What order of magnitude.

Bosley – No one-size-fits-all. But, just to give you a range of scale – the current enhancement to the Chesapeake Bay ports, which includes new sensors, visibility and stuff – that is $715,000 for the instrumentation, the labor to put it in, and the first year's O&M. The operation and maintenance is $235K. So, that is a large-end one. On the smaller end, Naragansett Bay was $550,000, I think.

Brown – As far as ENC, I think to put an order of magnitude on it, you're talking less than $10K to build what we need to build. Maintenance is a bit of a moving target because the technology is getting better in some respects, and also what kind of contractor resources might be available to help us out with some of these tasks also.

Peschel – Any estimate, Jay, about IWS?

Spalding – I look at it in an R&D phase to explore how such a network should be set up, and to begin working on some trial applications – we're looking at the order of several hundred thousand dollars.

Peschel – An AIS network, if you were to compare what a country like Portugal is about to do technologically, and if you would take that to the United States, it would be up into $100 million or so for an AIS network. But, there would have to be look-sees, any worth in tying an AIS network into the NDRS. Would there be a duplication of more towers than any coast needs? Where do we go from there? So, there needs to be some sort of plan to put this all together and look at the synergies.

A scenerio that I fear is of Intertanko, who issued a rather sharp castigation of United States ports and navigation – inconsistencies and perhaps unsafe practices – how many years ago was that now – 6 or 8? Now, we are on the advent of the year 2003, mandated IMO carriage for tankers, where there will be tankers coming into U.S. ports and right now there will not be a lot of AIS base stations by which to correlate that data. So, the U.S. is perhaps a bit behind the infrastructure 8-ball and perhaps there will be another castigating report.

Trbojevic – I think for large ports, . . . . . along these lines that I presented could be done for $200,000 to $250,000. However, if there are several ports which want to adopt the same management system and the same management practices, then the price drops down if they want to do that. But, we can manage to achieve savings for smaller ports by doing the same thing, but they have to agree that they will adopt the same practices and the same management system as big ports. Obviously, there are operations which are not applicable. But, in that case, savings can be achieved.

Question – I believe the Coast Guard was doing waterway analyses with stakeholders that was laying out what the general feelings were of the operators in assessing risk and determining, in many cases, I'll share both the electronic chart and P.O.R.T.S. came up as priorities versus actually going and building another risk assessment model. So, I guess it is as much a comment as a question.

Peschel – I would like to give thanks to Bruce Parker and all of the coordinators and organizers and for the opportunity for us to come in and meet with you all and give you our points of view. There are many suppliers that have booths and poster materials out in the lobby. It would be nice if you would all view these in the next few days.

I think the next session will be here in this room. Our dinner speaker will be speaking from this platform, so we will assemble here and eat afterwards. Thank you for this afternoon's attention.